

Linear and Angular Speed Worksheet

DJ Lil Boi Nav has a turntable that has two settings, 33 rpm or 45 rpm (revolutions per minute).

1. When the turntable is set at 33 revolutions per minute (rpm), what is its angular speed in radians per minute?

2. When the turntable is set at 45 rpm, what is its angular speed in radians per minute?

While a record is spinning, a ladybug lands on the turntable 10 inches from the center.

3. What is the linear speed (in inches per minute) of the ladybug when the turntable is set to:

a) 33 rpm

b) 45 rpm

4. The ladybug crawls towards the middle and is now 3 inches from the center, what is the linear speed (in inches per minute) of the ladybug when the turntable is set to:

a) 33 rpm

b) 45 rpm

5. Convert the speed of the bug in problem 3 at 33 rpm to miles per hour.

6. Convert the speed of the bug in problem 4 at 45 rpm to miles per hour.

7. A 16mm diameter shaft rotates at 1,500 rps (revolutions per second). Find the speed of a particle on its surface (to the nearest meter per second).

- 8.** An earth satellite travels in a circular orbit at 20,000 mph. If the radius of the orbit is 4,300 mi, what angular velocity (in radians per hour, to one decimal place) is generated?
- 9.** The earth revolves about the sun in an orbit that is approximately circular with a radius of 9.3×10^7 mi. The radius of orbit sweeps out an angle with what exact angular velocity (in radians per hour)? How fast (to the nearest hundred miles per hour) is the earth traveling around its orbit. Hint: it takes the earth 365 days to complete its orbit.
- 10.** The second hand on Mr. Incredible's watch is .25 inches long. How fast is the tip of the second hand moving? Give your answer in inches per second.
- 11.** A neighborhood carnival has a Ferris wheel whose radius is 30 feet. You measure the time it takes for one revolution to be 70 seconds. What is the linear speed (in feet per second) of this Ferris wheel? What is the angular speed in radians per second?
- 12.** A spin balancer rotates the wheel of a car at 480 revolutions per minute. If the diameter of the wheel is 26 inches, what road speed is being tested? Express your answer in miles per hour. At how many revolutions per minute should the balancer be set to test a road speed of 80 miles per hour?
- 13.** A Ford Expedition comes standard with tires that have a diameter of 25 inches. If the owner decided to upgrade to tires with a diameter of 30 inches without having the onboard computer updated, how fast will the Expedition actually be traveling when the speedometer reads 75 mph?

Find the missing arc length, central angle, or radius.

14. $s=10$, $r=15$

15. $\theta = \frac{3\pi}{7}$, $r=21$

16. $\theta = \frac{\pi}{4}$, $s=3\pi$

Point P is on the edge of a rotating tray. Find the angular displacement in radians for the given number of revolutions and the angular velocity in radians per minute for the given time.

17. $\frac{1}{5}$ revolutions in 3 minutes

18. $12\frac{3}{8}$ revolutions in 7 minutes

Calculate the linear velocity, V , of an object rotating at angular velocity, ω , at a distance r from the center.

19. $R= 12$ cm, $\omega=5\pi$ rad/sec

20. $R= 49$ cm, $\omega=\frac{\pi}{7}$ rad/sec

Applications of arc length, angular and linear velocity. HINT: draw a picture.

21. A flywheel rotates with an angular velocity of 2 rev/sec. find the linear velocity if the radius is 15 inches.

22. The radius of a soccer ball is 18cm. what is the length of an arc of the ball for a central angle of 45 degrees?

23. Find the length of a pendulum if it oscillates through an angle of 10 degrees and swings a distance of 6π inches from one end to the other.

24. Calculate the linear velocity of a reflector located 10 inches from the center of a bicycle wheel rotating at 7π rad/sec.

25. Calculate the angular velocity of an LP record spinning at $33\frac{1}{3}$ rotations per minute.
26. The propellers on an average freighter have a radius of 4 feet. At full speed ahead, the propellers turn at 150 revolutions per minute. What is the angular velocity in radians per minute? What is the linear velocity in feet per minute at the tip of the blades?
27. David puts a rock in his sling and starts whirling it around. He realizes that in order for the rock to reach Goliath, it must leave the sling at a speed of 60 feet per second. So, he swings the sling in a circular path of radius 4 feet. What must the angular velocity be in order for David to achieve his objective?
28. Sandy pulls the cord on her lawn mower. In order for the engine to start, the pulley must turn at 180 rpm. The pulley has a radius of .2 feet. How many radians per second must the pulley turn? How fast must Sandy pull the cord to start the mower?
29. The table below lists the sizes for certain electric vehicles. Find the speed of each vehicle in mph when the wheels are turning at 800 rev/min. Which car is going fastest?

Vehicle	Tire Diameter
Nissan Leaf SL	25.5 inches
Chevy Volt	26.3 inches
Tesla S	27.7 inches